

**Comments Received by the U.S. Environmental Protection
Agency During the Public Review Period
(February 27, 2007 – March 29, 2007)
of the Draft *Inventory of U.S. Greenhouse Gas Emissions and
Sinks: 1990-2005***

Comment 1

Lisa McFadden—National Lime Association

February 22, 2007

Re: Request for public comment on draft of “EPA’s Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005.”

Dear Mr. Hockstad & Ms. Hanle:

Thank you for the opportunity to comment on the draft of “EPA’s Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005.” Like past reports, the Industrial Processes chapter of the report updates estimated greenhouse gas releases from lime manufacturing (section 4.4, Lime Manufacture (IPCC Source Category 2A2)).

We have one editorial comment concerning that section. On page 4-15, the first paragraph currently states the following:

2 Production was adjusted to remove the mass of chemically combined water found in hydrated lime, using the
3 midpoint of default ranges provided by the *IPCC Good Practice Guidance (IPCC 2000)*. These factors set the
4 chemically combined water content to 24.3 percent for high-calcium hydrated lime, and 27.3 percent for dolomitic
5 hydrated lime. (*emphasis added*)

We believe the reference to “using the midpoint of default ranges provided by the IPCC Good Practice Guidance (IPCC 2000),” as highlighted above is incorrect because the basis for the factors was not found in the IPCC 2000 guidance. Rather the factors were based upon the molecular weights of H₂O (18), Ca(OH)₂ (74), and Ca(OH)₂ Mg(OH)₂ (132) for conversion of dolomitic lime at 27% (18/74) and high calcium lime at 24.3% (18x2/132). Please see attached the comments of Dec. 14, 2006 regarding this matter.

Please don’t hesitate to contact me at 703.243.5463 if you have any questions concerning these comments or if I can provide further information.

Sincerely,
Lisa McFadden
Director, Information Systems

Attachment:

December 14, 2006
Ms. Andrea Denny
U.S. Environmental Protection Agency
State and Local Climate Change Program
1200 Pennsylvania Ave., NW
Washington, DC 20460
SENT VIA E-MAIL

Dear Ms. Denny:

Thank you for the opportunity to comment on the draft of EPA's Methods for Estimating Non-Energy Greenhouse Gas Emissions from Industrial Processes, Volume 8, Chapter 6 (August 2004). As we discussed in our phone call today, we have two comments on the Section 4.2, Carbon Dioxide from Lime Manufacture, Step (2) Correct for Moisture in Hydrated Lime:

1. On page 6.4-6, the percentages appear to be switched in the last line of the first paragraph:

“Using the midpoints as default values, the water content may be assumed to be 27 percent for high calcium lime and 24 percent for dolomitic lime.”

Based upon the molecular weights of H_2O (18), $\text{Ca}(\text{OH})_2$ (74), and $\text{Ca}(\text{OH})_2 \text{Mg}(\text{OH})_2$ (132), the conversion factors for dolomitic lime would be expected to be 27 % (18/74) and high calcium lime would be 24.3% (18x2/132). So the line should be corrected to:

“Using the midpoints as default values, the water content may be assumed to be 24 percent for high calcium lime and 27 percent for dolomitic lime.”

This also appears to be a mistake in the EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, April 2005 (Section 4.4, page 4-15).

2. To be more precise, you may want to change the words “moisture” and “water” to “chemically combined water.” Note that this terminology is consistent with the EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks, April 2005 (Section 4.4).

If you or your contractor have any questions, I can be reached at ecoyner@lime.org or 703-908-0772.

Sincerely,
Emily Coyner
Director of Regulatory Issues

Comment 2

Robert H. McFadden—GHG Associates

March 8, 2007

RE: Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks (1990-2005)

Comment on the Executive Summary : Table ES-9 Recent Trends in Various U.S. Data and Global Atmospheric CO₂ Concentration; and Table 2.2 of Chapter 2.

This table raises a number of questions, including the meaning and purpose of including data on global atmospheric CO₂ concentrations. It appears to imply a connection between various data of one nation (the U.S.) with global atmospheric CO₂ concentrations. On its face, the table appears to claim that the growth rates of U.S. greenhouse gas emissions, U.S. energy consumption, U.S. fossil fuel consumption, U.S. GDP, and U.S. population are all somehow in lock-step with the growth rate of the global atmosphere CO₂ concentration. It further appears to suggest that the growth rates of six U.S. factors by themselves account for the global CO₂ concentration growth rate. In addition :

1. The table suggests a comparison of U.S. emissions of six gases with a global single gas (CO₂) concentration . To be balanced, the growth rate trends of other concentrations, such as methane and nitrous oxide, need to be shown. In fact, the growth rate of atmospheric methane has declined since 1990.
2. The table appears to compare emissions with concentrations , as if on a one-to-one basis, although the IPCC notes that in the case of CO₂ emissions only about 50% reach the atmosphere. Thus, the growth rate of CO₂ emissions is not the same as the growth rate of CO₂ entering the atmosphere
3. Moreover, since data on GHG emissions, energy consumption and GDP are shown, one would expect to see data on energy and GHG intensity rates.

The simplest, cleanest solution would be to delete the atmospheric CO₂ concentration data. The mandate of this report is emissions, not concentrations. The fact that this table has appeared in earlier inventories is not a rational argument for it's validity or retention.

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Comment 3

Michael R. Benoit

March 16, 2007

Comments on "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005" – Federal Register Feb. 27, 2007

These comments are being provided in response to USEPA's solicitation for comment in the notice [FRL-8281-2] that appeared in Federal Register Volume 72, Number 38 on February 27, 2007.

Aside from a brief casual mention that water vapor is a "naturally occurring greenhouse gas," the Agency's inventory never begins to acknowledge that water vapor is the single most abundant greenhouse gas in the atmosphere which exerts a greenhouse effect that dwarfs the combined effect of the other gases. Water vapor comprises 95% of greenhouse gas, compared to about 3.5% for carbon dioxide. EPA's inventory of greenhouse gas "emissions" also fails to include non-anthropogenic sources of carbon dioxide, which account for over 97% of the total CO₂ in the atmosphere. (Sources:

<http://lwf.ncdc.noaa.gov/oa/climate/gases.html#wv> and
http://www.geocraft.com/WVFossils/greenhouse_data.html)

It appears USEPA is deliberately playing into the hands of global warming activists and alarmists by focusing its "inventory" solely on anthropogenic sources of greenhouse gases while ignoring completely the fact that water vapor, which is almost 100% from natural sources (mainly oceanic evaporation), overwhelms the contribution from all other sources, both natural and man-made. No responsible inventory of greenhouse gases should ignore the dominant effect of water vapor simply because it is not an "emission" in the usual sense of the term. Failing to properly and prominently describe the well-understood role of water vapor puts the Agency in the position of advocating a political perspective instead of reporting critical facts.

I urge EPA to add language to its greenhouse gas inventory making clear that it is accounting for only about 5% of the greenhouse gases known to exist in the earth's atmosphere and that its focus on anthropogenic sources of carbon dioxide relate to only 3% of total carbon dioxide emissions because 97% of those emissions are from natural sources.

Absent those clarifications, EPA's greenhouse gas inventory provides a grossly inaccurate and incomplete analysis that fosters continued public ignorance of the pivotal role played by water vapor in the natural cycles responsible for changes in the earth's climate. Refusal to make such changes in the face of abundant supporting data would amount to deliberate obfuscation and would be an abdication of the Agency's responsibility.

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Comment 4

Christopher Woodall—U.S. Forest Service

March 26, 2007

Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005

Overall Comments: Given my national inventory responsibilities, I focused my review on the forest sections, in particular dead wood. I found nothing egregiously wrong or incorrect. I see many challenges with moving estimation of forest land C components, such as dead wood, from model-based to sampling design-based. I have provided some “heads up” comments so that you may be better prepared for changes to the national forest inventory in the years ahead.

Specific Comments:

1) Page 7-4, Line 15. I don’t know if this statement is true...are you talking about the proportion of carbon per unit volume of trees...if so this statement is true. If you are talking about total tree C content, then healthy growing large trees might always sequester more C than smaller trees.

2) Page 7-5, Line 1. Doesn’t Alaska cause heartburn? I am interested to see how you will reconcile 1990 estimates when the AK inventory comes online. As a head’s up, west Texas was never really inventoried. RPA estimates pegged the forest land at 10 million acres. The FIA program manager for the Southern Research Station said that there are about ready to release actual inventory estimates for west Texas...might end up being 50 million acres in reality. Could cause problems in the years ahead with reconciliation?

3) Page 7-8, Line 30. “Snapshot” files will no longer be maintained in the future as we are moving towards a more dynamic data management system. Linda Heath has been informed a few weeks ago. This transition from older data management systems will be painful for static estimation engines and applications; however, we will try to help these national estimation efforts out. So in other words, forest carbon stocks and fluxes will be estimated using a different database in the future.

4) Page 7-9, Line 27. Does the IPCC dictate that fine woody debris is included in the litter C pool? They are inventoried in fundamentally different ways by FIA. Right now estimates are based on Heath’s FORCARB model, but we would expect in the future that these estimates will be based on an actual inventory. Currently, the FIA soil indicator measures small fine wood debris C (< 0.25 inches), while the down woody materials indicator estimates FWD C greater than 0.25 inches. Not a problem for this manuscript...but just another head’s up for the future.

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Comment 5

William C. Herz—The Fertilizer Institute

March 27, 2007

The Fertilizer Institute Comments on the Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2005

Dear Mr. Hockstad:

The Fertilizer Institute (TFI), on behalf of its member companies, submits comments in response to the U.S. Environmental Protection Agency's ("EPA's") Notice of Document Availability and Request for Comments, published in the *Federal Register* on February 27, 2007, and appearing at 72 Fed. Reg. 8731. This Notice announces the availability of the "Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005" for public review and comment (hereinafter referred to as "*Draft Inventory*").

Statement of Interest

TFI represents the nation's fertilizer industry including producers, importers, retailers, wholesalers and companies that provide services to the fertilizer industry. Its membership is served by a full-time Washington, DC, staff in various legislative, educational and technical areas as well as with information and public relations programs. TFI's members produce ammonia, urea, nitric acid, and phosphoric acid, manufacturing processes identified by EPA in the *Draft Inventory* as causing or contributing to greenhouse gas emissions. As such, TFI and its members have an interest in EPA's activities relating to the *Draft Inventory*.

TFI Comments

TFI offers the following comments on the *Draft Inventory*.

1. The *Draft Inventory* Does Not Recognize Benefits of Best Management Practice Utilization in the Agricultural Land Management Category

Adoption of best management practices ("BMPs") that may eliminate or minimize greenhouse gas emissions is critically important for agricultural producers and a priority for those who serve them. The best ways to prevent urea volatilization are to apply it during cool periods, or to incorporate the fertilizer as soon as possible after application preferably with tillage and subsequent irrigation or rain. TFI and the International Plant Nutrition Institute ("IPNI") maintain a joint Nutrient Use task force that seeks to encourage the adoption and utilization of BMPs through a paradigm focused on the right product, applied at the right rate, time and place. In addition, attention must be paid to balanced nutrition as the uptake of nutrients is dependent, in part, on the availability of other essential nutrients. In fact, a recent study by Montana State University confirms that urea fertilizer emissions can be greatly reduced by appropriate BMP utilization, paying attention to environmental conditions at the time and shortly after

application.¹ Temperature and moisture can both affect urea hydrolysis rates and ammonia loss from surface applied urea fertilizers. Although there is always a risk of losing nitrogen to the atmosphere, well thought out planning can greatly minimize the potential for nitrogen loss.

In addition, fertilizer emissions can be reduced by the use of various enhanced efficiency products, that may contain urease inhibitors or other means to more closely match the release of nutrients to the crops' growth curve. The fertilizer industry is committed to the environmentally sound and efficient use of its products. Modern farming practices use fertilizer nutrients to build high yielding, nutritious crops, and also make it possible for people to continue to enjoy large areas of land for forests, parks and wildlife areas.

The development of enhanced efficiency fertilizers, crop-specific BMPs, and precision agriculture tools are central to our industry's environmental stewardship program. With the use of these crop nutrients, farmers can improve efficiencies, by reducing losses to the environment.

As these tools are utilized by an increasing number of US farmers, we formally request that EPA revise the estimates for this category to reflect their adoption and utilization within American agricultural systems and reduce the greenhouse gas emissions by a corresponding amount.

2. The Draft Inventory Does Not Cite the Latest Urea and Ammonia Production

Given that the *Draft Inventory* covers the period of 2002 – 2005 we request that the figures given for ammonia production, urea production, and urea net imports be updated to reflect 2005 data. Domestic ammonia production declined by greater than 8% from 2004 to 2005 (10,939 M metric tons in 2004 v. 10,143 M metric tons in 2005) and urea production by a similar 8.5% (5,755 M metric tons in 2004 v. 5,267 M metric tons in 2005). This corresponds to a concomitant increase in urea net imports of greater than 17% (4,231 M metric tons in 2004 v. 5,138 M metric tons in 2005).

TFI formally requests that greenhouse gas emissions for the Ammonia category be further reduced by 8.5% to reflect 2005 production numbers.

3. The Draft Inventory Does Not Account for Increases in Ammonia Production Efficiency

In addition, our members are producing anhydrous ammonia with greater efficiency than ever before. In reviewing the *Draft Inventory*, it appears that EPA has not accounted for improvements in manufacturing process efficiency achieved since 1990 (please see attached figure). For example, in 1990 it took greater than 34.5 million BTU to produce a ton of anhydrous ammonia. In 2005, that same ton of anhydrous ammonia was produced using less than 33 million BTU – an increase in production efficiency of 5.6%. TFI requests that emission totals be decreased by 5.6% to reflect these gains.

4. Domestic Sources Have Emissions Attributed from Urea Imports

The methodology in the *Draft Inventory* also makes another unfair assumption regarding the domestic nitrogen industry – the CO₂ emissions from imported urea are attributed to the domestic nitrogen industry. As stated on p. 4-11:

¹ <http://landresources.montana.edu/SoilFertility/ammonvolat.html>

The calculation of the total non-combustion CO₂ emissions from nitrogenous fertilizers accounts for CO₂ emissions from the application of imported and domestically produced urea. For each ton of imported urea applied, 0.73 tons of CO₂ are emitted to the atmosphere. The amount of imported urea applied is calculated based on the net of urea imports and exports.

The problem with this is that domestic manufacturers have these emissions rolled up into this one category, when, in many cases, these are unique entities importing urea into the U.S. without a corresponding domestic manufacturing concern. In addition, if this urea is produced in a country also producing a greenhouse gas inventory document; then these urea emissions from the field would be double counted using current IPCC methodology. This also assumes that all imported urea is being applied to fields; which is not accurate. Some of this imported urea is used as a product in chemical and manufacturing sectors; and the associated CO₂ may not be released or may be captured for reuse.

Finally, as stated in Section F of these comments, Canada has proposed that CO₂ emissions from the use of urea will not be covered under their regulatory schemata and thus will not be attributed to nitrogen fertilizer manufacturers.

5. The *Draft Inventory* Does Not Recognize “Off-Sets” for Using “Waste” Heat

TFI believes that the *Draft Inventory* should recognize for both the phosphate fertilizer and nitric acid categories efforts by manufacturers to utilize “waste” heat that would otherwise be vented to the atmosphere and reduce reported greenhouse gas emissions accordingly. This applies both to the production of phosphate fertilizer and nitric acid. For phosphate production, the waste heat from sulfuric acid production is recaptured and utilized to generate electricity and as a direct off-set to use of other energy sources. This beneficial reuse scenario truly represents green energy and should be recognized and encouraged by EPA and, as such, addressed in the *Draft Inventory*.

If necessary, TFI is willing to solicit this information from its members and report it to EPA. TFI estimates that members’ phosphate facilities, alone, off-set at minimum 6.8 to 10 million metric tons of greenhouse gases by capturing waste heat in sulfuric acid production and making electricity. This electricity is then sold back into the grid of the applicable power company.

TFI believes that the capture and use of this green energy should more than off-set all the CO₂ or equivalent that phosphate companies produce; and a partial off-set should be applied to nitric acid production.

6. The *Draft Inventory* Inappropriately Attributes CO₂ Emissions Associated with the Application of Urea Fertilizer to Urea Manufacturers

In Section 4.0 of the *Draft Inventory*, EPA discusses “Ammonia Production and Urea Application” in a single subsection. *See Draft Inventory*, Section 4.3. In this subsection, EPA discusses ammonia manufacture, with the co-production of CO₂, and recognizes that many ammonia manufacturers capture the CO₂ generated during ammonia production and use it in the production of urea. *See Draft Inventory*, pg. 4-10 – 4-11. Despite this recognition, EPA nonetheless attributes any CO₂ released by farmers and others land applying urea fertilizer to the ammonia and urea manufacturers. *Id.* at 4-11 (“Total CO₂ emissions resulting from nitrogenous

fertilizer production do not change as a result of this calculation, but some of the CO₂ emissions are attributed to ammonia production and some of the CO₂ emissions are attributed to urea application”).

Based on a review of the *Draft Inventory*, the ammonia/urea production category is the only category where CO₂ emissions resulting from subsequent use of a material are attributed back to the manufacturing industry. For example, in the “Petrochemical Production” subsection, EPA describes the production of petrochemicals resulting in “small amounts of CH₄ and CO₂ emissions.” See *Draft Inventory*, pg. 4-36. There is no attribution of CH₄, CO₂, and N₂O emissions from sources/processes using petrochemicals to the Petrochemical Production sector. Rather, the sources that *use* petrochemicals are identified as the producers of the CH₄, CO₂, and N₂O associated with petrochemical combustion and noncombustion activities. See, e.g., *Draft Inventory*, Section 3.4 (“Mobile Combustion”). Similarly, there is no attribution of greenhouse gases associated with coal usage to coal manufacturers. See *Draft Inventory*, Section 3.5 (“Coal Mining”). Rather, the sources that *use* coal are identified as the producers of greenhouse gases associated with those uses. See, e.g., *Draft Inventory*, Section 3.2 (“Carbon Emitted from Non-Energy Uses of Fossil Fuels”), Section 3.3 (“Stationary Combustion (Excluding CO₂)”).

Attributing CO₂ emissions associated with urea application to ammonia/urea manufacturers is significant. According to the *Draft Inventory*, in 2004 approximately 43 percent of the CO₂ emissions identified by EPA for the ammonia/urea production category were due to urea application. *Draft Inventory*, pg. 4-11 (Table 4-11). EPA should act consistently throughout the *Draft Inventory* and attribute emissions to categories only when that category generates the emissions in question.

In addition, as industries are typically categorized in the U.S. by either Standard Industrial Classification (“SIC”) code or more currently – the North American Industry Classification System (“NAICS”), and EPA tends to regulate using these classifications, this also seems a logical way to characterize our industry. We also believe that the Intergovernmental Panel on Climate Change (“IPCC”) 2006 guidelines allow for this issue to be quantified in a manner consistent with the regulatory structure inherent in the country the data are generated. Thus the utilization of NAICS code 325311, for Nitrogenous Fertilizer Manufacturing, should pertain only to manufacturing activities, as it is defined as:

- (1) manufacturing nitrogenous fertilizer materials and mixing ingredients into fertilizers;
- (2) manufacturing fertilizers from sewage or animal waste; and
- (3) manufacturing nitrogenous materials and mixing them into fertilizers.²

In addition, we suggest that EPA utilize the NAICS definition for Nitrogenous Fertilizer Manufacturing as seems to be the case with most other categories referenced.

Such an approach is embraced in the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* document wherein the IPCC states that the greenhouse inventory “should contain neither over nor underestimates so far as can be judged, and the uncertainties in these estimates should be *reduced as far as practicable*.” IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, pg.

² <http://www.census.gov/epcd/ec97/def/325311.TXT>

1.4. Therefore, we formally request that the reported amounts of CO₂ emissions for the Ammonia/Urea category be reduced accordingly (by 43%).

Another important point relates to Canada and their regulatory process surrounding greenhouse gas emissions. Canada has proposed that CO₂ emissions from the use of urea will not be covered under their regulatory schemata and thus will not be attributed to nitrogen fertilizer manufacturers. In addition, they have begun interaction with the IPCC to correct the methodology of attributing CO₂ stored in urea to manufacturers.³ It is important as well to be consistent within North America on the appropriate accounting regarding urea application.

In fact, given that a category already exists for Agricultural Soil Management (p. 2-11) which includes exactly those emissions for all other crop inputs we are not clear why urea application alone is attributed back to the ammonia manufacturing industry. Specifically, this category includes, among other factors “Direct additions occur through the application of synthetic and organic fertilizers; production of nitrogen-fixing crops and forages; the application of livestock manure, crop residues, and sewage sludge; cultivation of high-organic-content soils; and direct excretion by animals onto soil.”

Further quoting, “Indirect additions result from volatilization and subsequent atmospheric deposition, and from leaching and surface run-off of some of the nitrogen applied to or deposited on soils as fertilizer, livestock manure, and sewage sludge.” It seems clear that this category was designed with the intent of capturing these emissions.

Therefore, we request that emissions associated with urea application be included in the Agricultural Soil Management category.

Conclusion

TFI looks forward to working with EPA in developing an accurate *Draft Inventory*. We believe that the issues we have raised must be address in the final *Inventory Report*. Should you have any questions regarding our comments, please contact me at (202) 515-2706, or by email at wcherz@tfi.org.

Sincerely yours,

William C. Herz
Vice President, Scientific Programs

³ PowerPoint Presentation: Natural Resources Canada (Adam Hendricks and Ken Olsen) to the Canadian Fertilizer Institute, May 2005

Comment 6

Allison M. Thomson—Joint Global Change Research Institute

March 28, 2007

RE: Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005

Tom,

I've been able to review some of the draft inventory and have a couple of comments for you. In general, the work is very solid and the methods and procedures are well established and documented. I did not find any errors in methods or results.

My primary comment (section 7.3) is that my general understanding is that US agriculture is a sink for C because of land being put aside in CRP, which is stated as a part of the reason for the increase in Table 7.16. If possible, it would be very useful to know how much of this increase (is it 5 or 50%?) is from which land use. Because, from my reading, I have the impression that when you take CRP land out of the picture, US agriculture is still a source for C (on aggregate).

There has been discussion in the EPIC modeling community about the high sequestration projected by Century when compared to the NRI based runs done by Steve Potter and others at Blacklands Research Center in Texas.

Work that Cesar and I have done indicates that about 10-20% of the difference is due to soil erosion, which is not considered in Century.

This is a long-winded way of saying I consider Century to be on the high end of the SOC sequestration scale, therefore a breakdown of where conclusion that cropland is a sink is coming from would be very helpful.

While the error checking and model verification sections are strong, it is lacking strong model validation. P 7-24 mentions a validation with site specific data on lines 28-31, but no indication of the results are given. The citation is there, and I think it would increase confidence in the model to include a short description of the validation here.

All of my questions about the modeling were answered in the Annex sections, which I was able to skim through but did not have time to review thoroughly. The structure of the land use categories leads to redundancy, but I realize you don't have control over this aspect. In general, I found it to be very well written.

Thanks for giving me the chance to participate,

Allison
Allison M. Thomson
Research Scientist

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Comment 7

Bruce Steiner—American Iron and Steel Institute

March 28, 2007

Leif,

Following are a few comments on Section 4.2 (pages 4-6 – 4-10 of the draft report) relating to Iron and Steel Production.

Page 4-6, line 29

Pig iron contains about 4% carbon, not 0.4%.

Page 4-7, line 15

“oxidized and the iron ore is reduced.”

Page 4-7, lines 20-21

Emissions have not so much “fluctuated” as “declined steadily.” And the reasons for the drop are multitude, including restructuring of the industry, technological improvements, increased scrap utilization, and emphasis on energy conservation. Domestic economic conditions have not been a significant factor in recent years, and it is misleading to attribute changes to that factor or to changes in the import/export mix.

Page 4-7, lines 34-35

Coking coal is not actually “consumed” at coke plants but rather is converted to coke. And coking coal is not “produced” – coke is produced.

Page 4-8, line 1

Steel scrap has a carbon content of approximately 0.04%, not 0.4%. Moreover, it is not “released” but rather is absorbed into the steel produced in the furnace.

Page 4-8, line 17

Steel carbon varies significantly, but 0.4% is much too high for an overall assumption. A better factor is 0.04%, same as scrap steel.

General Comments

It is not clear whether all coal converted at all coke plants is used as a basis for calculating steel industry emissions or only coal converted to coke for use in blast furnaces, the latter being the more accurate. If the chapter is intended to include iron and steel foundries, however, it is fair to assume all carbon from cokemaking is attributable to this category. In any event, however, not all coke produced at U.S. coke plants goes to U.S. blast furnaces (and foundries) because some is exported. Conversely, not all coke consumed in U.S. blast furnaces (or foundries) is produced in the U.S. Rather than calculating emissions based on coal converted in coke plants, coke consumption in blast furnaces (and possibly foundries) is the better metric.

It is also not clear whether carbon dioxide emissions from BOF steel production is accounted for separately (see entry in Table 4-9). Any CO₂ emitted from that process would already be accounted for in the carbon in the pig iron from the blast furnace, which originates with the carbon in the coal used to produce coke. Carbon in scrap would be offset by carbon in the steel produced in a BOF.

Carbon emissions from sintering originate with carbon in the fuel used to support the sintering process. If it is coke, it is already accounted for by the coke plant production value and should not be counted again. If it is natural gas, it should be accounted for as a general energy source and not attributable to iron and steel processing. Some carbon in sintering may also be attributable to limestone or dolomite, but by the accounting rules used for this report (to be revised when the 2006 IPCC methodology is adopted) suggest this carbon is attributable to the minerals sector – in the same manner that limestone and dolomite usage in blast furnaces is not accounted for in this report.

We have questions as to the legitimacy of the methane emission factors used for coke, pig iron, and sinter production but have no alternative values to suggest. Intuitively, however, we cannot envision fugitive emissions of methane from the blast furnace for pig iron production or in the sintering process.

We believe the use of methodologies described in the 2006 IPCC guidance will present a much more accurate picture of steel industry GHG emissions.

Happy to talk through some of this if you wish.

Bruce Steiner

Comment 8

Bruce Steiner—American Iron and Steel Institute

March 29, 2007

Mausami,

I hereby retract my claim that steel contains 0.04% carbon. I was thinking in terms of low-carbon steels, which can have contents that low. Carbon contents vary widely, but the 0.4% figure in your text is probably a good average for inventory purposes. See http://en.wikipedia.org/wiki/Carbon_steel or <http://www.key-to-steel.com/Articles/Art62.htm>. If you would rather not use a website reference, I can fax you some pages from the steel manual called 'The Heating, Treating & Shaping of Steel' tomorrow. I apologize for the false alarm on the number.

Steel scrap, of course, would have the same carbon contents as steel - also highly variable - but 0.4% would be a good average there also.

However, I stand by the comment that carbon content of scrap coming into the steelmaking furnace is offset by the carbon content of the steel being produced in that furnace, so it doesn't make sense to count the carbon in scrap as an emission.

Call if you wish to discuss further. I'll be in and out of meetings all day Friday.

Bruce

Comment 9

Ozzie Morris—The Mosaic Company

March 29, 2007

The Draft Inventory Does Not Recognize 'Off-Sets' for Using 'Waste' Heat

Mosaic believes that the Draft Inventory should recognize the efforts by phosphoric acid production manufacturers to utilize 'waste heat' that would otherwise be vented to the atmosphere and reduce reported greenhouse gas emissions accordingly. This applies both to the production of phosphate fertilizer and nitric acid. The majority of phosphoric acid production in the U.S. is by the 'Wet Process' that utilizes sulfuric acid in the chemical reactions described on page 4-24 of the draft Inventory. The waste heat in sulfuric acid production is recaptured and utilized to generate electricity and as a direct off-set to use of other energy sources. This beneficial reuse scenario truly represents green energy and should be recognized and encouraged by EPA and, as such, addressed in the Draft Inventory.

Mosaic's Sulfuric Acid operations produce approximately 123.5 KWH of electricity per ton of sulfuric acid produced. This is accomplished by capturing 'waste heat' from a fuel source that does not produce any greenhouse gases. Phosphoric Acid production, due to the need for sulfuric acid and investments in heat recovery and electricity production, off-sets over 3200 times the amount of Carbon Dioxide that process emits. Mosaic believes this estimate is generally representative for the U.S. phosphoric acid industry and is representative of the offsets that should be recognized on the energy side of the Draft Inventory.

Comment 10

Miyun Park—The Humane Society of the United States

March 29, 2007

RE: Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005

The Humane Society of the United States (The HSUS), the nation's largest animal protection organization, representing nearly 10 million members and constituents, welcomes the opportunity to submit comments to the U.S. Environmental Protection Agency (EPA) regarding its Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005 (Draft Inventory).

The HSUS is encouraged that the EPA recognizes that some greenhouse gas (GHG) emissions can be directly attributed to industrialized animal agriculture practices. Specifically, the agency notes that the primary reason for the overall increase in methane emissions is the shift towards housing pigs and cows used for the dairy industry in larger facilities that use liquid manure management systems.¹ Similarly, the agency notes that the overall increase in nitrous oxide emissions is largely due to changes in the poultry industries, namely the shift toward litter-based manure management systems, confinement in high-rise houses, and an overall increase in the U.S. poultry population.²

While the Draft Inventory accounts for animal agriculture industries' direct GHG emissions through enteric fermentation and manure management,³ the agency does not identify *all* GHG emissions attributable to animal agriculture industries. The agency notes that carbon dioxide (CO₂) emissions due to some land-use activities and on-farm energy use are accounted for in the chapter on "Land Use, Land-Use Change, and Forestry" and the chapter on "Energy," respectively.⁴ Nevertheless, these chapters do not apportion agriculture's contributions to CO₂ emissions, nor do they disaggregate animal agriculture's contributions to these CO₂ emissions. Finally, the Draft Inventory does not seem to account for CO₂ emissions resulting from deforestation for grazing; packaging, transporting, and applying nitrogen fertilizer for feedcrops; or energy used in processing facilities and for transportation of live animals and end products.

In contrast to the Draft Inventory, a recent report by the Food and Agriculture Organization (FAO) of the United Nations evaluates the many environmental impacts of animal agriculture industries, including GHG emissions. *Livestock's Long Shadow: Environmental Issues and Options* more comprehensively and accurately takes into account both their direct impacts and the impacts of feedcrop agriculture and deforestation for grazing.⁵

¹ U.S. Environmental Protection Agency. 2007. Inventory of U.S. greenhouse gas emissions and sinks: 1990 – 2005. Draft for public review, p. 6-7. February 20. www.epa.gov/climatechange/emissions/downloads07/07CR.pdf. Accessed March 12, 2007.

² Ibid.

³ Ibid, p. 6-1.

⁴ Ibid.

⁵ Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, and De Haan C. 2006. *Livestock's long shadow: environmental issues and options* (Rome: Food and Agriculture Organization of the United Nations, p. xx; p. 83). virtualcentre.org/en/library/key_pub/longshad/A0701E00.pdf. Accessed February 19, 2007.

The FAO has concluded that, on a global scale, animal agriculture industries are responsible for more GHG emissions (measured in CO₂ equivalent) than the share contributed by transportation.⁶ Animal agriculture industries are responsible for 9% of CO₂ emissions,⁷ accounting for sources such as on-farm fossil fuel use for lighting, temperature control, automated machinery, and ventilation (90 million tons per year);⁸ packaging, transporting, and applying nitrogen fertilizer for feedcrops (more than 40 million tons per year);⁹ and deforestation for grazing (2.4 billion tons per year).¹⁰

The HSUS requests that the EPA amend the Draft Inventory to identify the portion of CO₂ emissions attributable to the following aspects of animal agriculture industries:

- Feedcrop agriculture, including packaging, transporting, and applying nitrogen fertilizer for feedcrops
- Deforestation for grazing
- Energy used on-farm, including energy used for lighting, temperature control, automated machinery, and ventilation
- Energy used in processing facilities
- Energy used for transportation of live animals and end products

Thank you for your consideration.

Sincerely,



Miyun Park
Vice President, Farm Animal Welfare
The Humane Society of the United States

⁶ Ibid, p. xxi.

⁷ Ibid.

⁸ Ibid, pp. 88-9.

⁹ Ibid, p. 88).

¹⁰ Ibid, p. 90.

Comment 11

Patrick F. Mahoney—Energy Answers International

March 29, 2007

Re: Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005

Dear Mr. Hockstad,

I have reviewed the *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005* and would like to provide the following comments and information for your consideration.

The report indicates that methane emitted from landfills makes up 25% of the nation's methane emissions, and waste deposited at a landfill is expected to continue releasing methane for 10 to 60 years. Having identified landfills as a major source of greenhouse gases, I encourage the EPA to begin actively supporting resource recovery / waste-to-energy as an environmentally sound alternative.

I have attached the technical paper by Alan Eschenroeder, Ph.D. of the Harvard School of Public Health entitled *Greenhouse Gas Dynamics of Municipal Solid Waste Alternatives*. His extensive research and analysis concludes that "the replacement of landfills with municipal waste combustors significantly reduces greenhouse gas impacts." Significant cuts in the three most important gases -- carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (NO_x) can be achieved by eliminating landfills as the primary disposal point for solid waste and replacing fossil fuels with renewable energy sources including solid waste.

The European Union Landfill Directive, which essentially requires the phase-out of landfills for organics and other carbon containing materials by 2016 and will impose severe penalties for non-compliance, will have a dramatic impact on lowering greenhouse gas emissions. According to a study carried out by the Öko-Institute on behalf of the German Federal Environment Agency (UBA) and the Federal Environment Ministry (BMU), "The application of the Landfill Directive will save approximately 74 million tons CO₂ equivalents by 2016, thanks to avoided landfill gas (methane) emissions." "The study estimates that the saving of CO₂ equivalents could increase to 134 million tons if a landfill ban on untreated waste would be implemented across Europe." This study and other information which documents the EU's enlightened view of solid waste management can be downloaded from the Confederation of European Waste to Energy Plants website (www.cewep.com). The CEWEP website also presents a chart of the taxes and fines levied by governments throughout Europe to encourage waste producers to divert material from landfills and make recycling and combustion with energy and materials recovery a more viable option.

The March, 2007 article which I have attached entitled *Reduce CO₂? Build Incinerators!* concludes that "an ambitious European waste policy, with a balanced package of measures for prevention, re-use and thermal treatment of residual waste, will make a substantial contribution to reducing greenhouse CO₂ emissions." I encourage the EPA to analyze the data which has

supported the EU's efforts to minimize the use of landfills in favor of more environmentally sensitive options.

I also would like to comment that, since 1976 with the passage of the RCRA, the EPA has chosen to impose stringent air emission standards on waste-to-energy / resource recovery facilities while not requiring any gas monitoring, collection or treatment systems for landfills. The rationale for this inequity should be examined.

Energy Answers Corporation has more than 25 years of experience in environmental management of solid waste with a successful record of recovering recyclable material and energy from materials which otherwise would be landfilled. Our website (www.energyanswers.com) details our technology and "zero disposal" objective and the recognition and awards we have received from the American Academy of Environmental Engineers, Ecological Society of America, Smithsonian Institute and other organizations which have acknowledged our contributions to environmentally and economically sound waste management.

Thank you for the opportunity to comment and provide this information for your consideration.

Sincerely,

A handwritten signature in black ink, reading "Patrick F. Mahoney". The signature is written in a cursive, flowing style with a large, stylized 'P' and 'M'.

Patrick F. Mahoney, P.E., D.E.E.
President

Comment 12

Glen P. Kedzie—American Trucking Associations, Inc.

March 29, 2007

Comments of the American Trucking Associations, Inc. On the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005*

Introduction

The American Trucking Associations, Inc. (ATA), with offices at 2200 Mill Road, Alexandria, Virginia 22314-4677, is the trade association that represents the U.S. trucking industry.¹ As the national representative of the trucking industry, ATA is vitally interested in matters potentially affecting the nation's motor carriers. For this reason, ATA is submitting these comments in response to the agency's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005*.

The trucking industry is composed of both large national enterprises as well as a host of small businesses, all of whom operate in extremely competitive business environments, with narrow profit margins. According to the Department of Transportation, fully 97% of motor carriers (roughly 1,000,000 in number) have 20 or fewer trucks. For small carriers in particular, their livelihood can be dramatically impacted by new requirements such as those that may be imposed through the implementation of a greenhouse gas regulatory regime. In its capacity as the representative of the trucking industry, ATA regularly comments on matters affecting the national trucking industry's common interests, providing its expertise and understanding of the industry to help avoid unreasonable, inappropriate and/or unduly burdensome regulatory or legislative requirements.

Comments

A greater distinction is needed among the categories of transportation and mobile sources. In the report's most commonly read section, the Executive Summary, Table ES-2 includes transportation and mobile sources under the broad categories of "Fossil Fuel Combustion" and "Mobile Combustion". In Tables ES-3, ES-7 and ES-8, 2005 greenhouse gas (GHG) emissions from the transportation sector range from 1,899.5 Tg CO₂ Eq. to 2,015.8 Tg CO₂ Eq. Little discussion is provided explaining why emissions from the transportation sector are different in each of the tables. Based on these tables, the entire transportation sector is estimated to account for 26 to 28 percent of total U.S. GHG emissions.

To try and understand these estimates in more detail, *Chapter 3 - Energy* includes a section titled *Transportation End-User Sector* which corresponds with the low-end estimate contained in the Executive Summary. In Table 3-7, transportation end-users are classified by vehicle (*i.e.*, automobile, light-duty truck, other truck, etc.) and fuel (*i.e.*, gasoline, distillate fuel oil, jet fuel, etc.) type. This table is the first indication that gasoline vehicles contribute more than 62 percent of GHG emissions from the transportation sectors. However, no explanation is provided as to differences among the types of vehicles listed. For example, what constitutes a "light-duty truck" versus the category of "other truck" is never explained in this chapter.

¹ ATA is a united federation of motor carriers, state trucking associations, and national trucking conferences created to promote and protect the interests of the trucking industry. Its membership includes more than 1,700 trucking companies and industry suppliers of equipment and services. Directly and through its affiliated organizations, ATA represents over 34,000 companies and every size, type and class of motor carrier operation.

Only by working through the documentation contained in Annex 3 can one gain a better understanding of the emission estimates attributed to the transportation sector. For example, by reading footnote 24 you learn that the term “heavy-duty truck” includes vehicles that are sometimes classified as medium-duty trucks (those with a GVWR between 8,500 and 14,000 lbs.). Table A-108 estimates 385.8 Tg CO₂ Eq. for medium/heavy-duty trucks. This total is slightly more than the total attributed to the “other truck” category in Chapter 3. Again, why these differences exist is never explained.

In comparing Table A-108 to Table A-111, *GHG Emissions from Domestic Freight Transportation*, trucking is estimated to account for 385.8 Tg CO₂ Eq. (which is the same total attributed to the medium/heavy-duty truck category in Table A-108). Since it is unlikely that all medium/heavy-duty trucks are involved in trucking, it is difficult to determine how much of this total should actually be allocated to the trucking industry.

Another example as to where further sector emission breakdowns is warranted appears in Figure ES-16. Aviation is broken out as a separate mobile combustion category while the rest of the mobile source categories are lumped together under the overly-large category *Road & Other*. Different mobile sectors vary significantly in their GHG footprints. For instance, in terms of “overall” transportation GHG emissions, trucks contribute less than one-third the GHG of passenger vehicles (19% versus 60%). Passenger cars, light-duty trucks and motorcycles contribute 16.5% of all U.S. GHG emissions compared to 5.3% from medium and heavy-duty trucks. The stark difference between the auto industry’s GHG’s and trucking’s GHG footprint needs to be clearly depicted in all figures and tables contained in the inventory. Given the stark differences between the functionality of on-road users, ATA further requests that busses be categorized as a separate transportation subsector.

Conclusion

ATA appreciates the difficulties associated with developing a comprehensive GHG emissions inventory of this scale and magnitude. However, given the high level of attention focused on this issue, it is imperative that a comprehensive and well-documented inventory be presented. While transportation may be a commonly defined sector, clearly identifying both sector and sub-sector GHG emission contributions will assist both Congress and industry in discussing how to approach and implement any proposed regulatory measure.

Incorporating defined transportation subcategories, such as passenger transportation, medium/heavy-duty trucks, aviation, busses, etc. (as opposed to listing the entire sector as “Transportation” or “Fossil Fuel Combustion”) in the same context as other sources of GHG emissions, will help provide a better understanding of the sources and GHG emission levels associated with specific transportation sub-sectors.

Respectfully submitted,
Glen P. Kedzie
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Comment 13

Ted Michaels—Integrated Waste Services Association

March 28, 2007

RE: Comments on Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005

Dear Mr. Hockstad:

On behalf of the Integrated Waste Services Association (IWSA), I am submitting comments on EPA's Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005. IWSA is the national trade association representing companies and local governments engaged in the waste-to-energy industry. IWSA has a vested interest in EPA's draft inventory since waste-to-energy is an important tool in reducing greenhouse gas emissions, namely carbon dioxide and methane, on a nationwide basis.

There are 88 waste-to-energy plants operating in 26 states managing about 29 million tons of America's trash each year. Studies utilizing EPA's Municipal Solid Waste Decision Support Tool show that waste-to-energy is a net negative emitter of greenhouse gases and is the best post-recycled waste management option with respect to reducing greenhouse gas emissions.

Our comments specifically relate to two sections of EPA's draft report – Municipal Solid Waste Combustion (Section 3.9 and Annex 3.6), and Landfills (Section 8.1 and Annex 3.14).

Attachment 1 to this letter contains our detailed comments, and Attachments 2 and 3 contain two key documents, the *Biocycle* article (Simmons et al. 2006) frequently referenced herein, and a nitrous oxide emission test report (Avogadro 2007). So the reader does not miss our main points when reviewing the detailed comments, we have summarized them here:

1. The draft report over-estimates the amount of municipal solid waste (MSW) combusted by 31% when properly compared to the amount documented by *Biocycle* (Simmons et al., 2006). Values for total waste combusted in the draft report result from the mistaken use of the *Biocycle* data. EPA should correct these values;
2. *Biocycle* waste reports are credible and endorsed by the EPA Office of Solid Waste and others. Industry and the Department of Energy/Energy Information
3. Administration data support the *Biocycle* data. The draft report inappropriately relies on data from the *Characterization of Municipal Solid Waste in the United States* report series, also known as the Franklin reports (e.g., USEPA 2006). The Franklin reports seriously understate the total MSW discards and amount landfilled; as a result, the proportion of plastics and other fossil derived waste components assumed to be sent to combustion is over-stated. EPA should rely on waste generation, combustion, and landfilling data from *Biocycle* to estimate the total discards and the proportion of components that are combusted;

4. The draft report significantly over-estimates the amount of CO₂ emitted by municipal solid waste (MSW) combustion. The main cause of this over-estimate is reliance on the aforementioned Franklin report data, which EPA should change;
5. The draft report mistakenly gives the reader the impression that CO₂ emissions from tire combustion occur at waste-to-energy facilities. EPA should clarify that, of the tires disposed via combustion, the vast majority is combusted as tire derived fuel (TDF) in other types of plants such as cement kilns, pulp and paper plants, industrial/utility boilers, and dedicated tire-to-energy plants;
6. The draft report relies on older, foreign data to estimate N₂O emissions from MSW combustion. EPA should re-examine N₂O emissions based on recent test data we are providing, and conclude that modern waste-to-energy facilities are not significant sources on N₂O emissions; and,
7. The draft report fails to recognize the high degree of uncertainty regarding methane emissions from landfills. EPA should review its uncertainty analysis for landfills, as data suggest that the errors associated with LFG methane estimates are greater than the uncertainty range given in the report.

IWSA has invested considerable effort in our detailed critique of the draft report and is confident of our conclusions. For example, we have estimated total waste-to-energy CO₂ emissions using an independent simplified method, as presented in the comments, and it reinforces our conclusion that EPA over-estimated emissions in the draft report by at least a factor of two.

Thank you for consideration of our comments. IWSA is available to discuss this information at your convenience, and looks forward to working with the Agency on this important issue.

Sincerely,

Ted Michaels
President

Attachment 1

IWSA Comments on EPA's Draft U.S. Greenhouse Gas Inventory Report General Comments:

EPA's draft report significantly over-estimates the amount of CO₂ emitted by municipal solid waste (MSW) combustion. It uses the wrong database (the Franklin reports) to quantify MSW generation, discards, and landfilling, and the proportion of fossil-containing plastics and other discards sent to combustion. EPA should use a more accurate database (*Biocycle* reports), presently endorsed by other agencies, to estimate the total discards and the proportion of fossil components that are combusted.

The draft report also fails to recognize the high degree of uncertainty regarding methane emissions from landfills. Virtually any technical paper that addresses landfill gas generation, collection and management identifies uncertainties. According to EPA's own documentation there are error sources; however the origin of the -39 to +32 % error band is never provided in the draft report. IWSA does not have access to the data necessary to quantify this error range; however the EPA should present the facts, assumptions and analysis for calculation of error.

Specific Comments:

Comment 1. EPA's draft report significantly overstates the quantity of MSW combusted for the years 2001 through 2005. (Section 3.9, page 3-50, line 33; Section 3.9, page 3-52, Table 3-45; Annex 3.6, page A-149, Table A-136.)

The draft report bases MSW combustion quantities on *Biocycle's State of Garbage in America* survey (Simmons et al., 2006). This biennial survey is rightfully recognized as a credible source of MSW generation, recycling, and disposal data because it obtains MSW data directly from state agencies responsible for its management. However, EPA incorrectly applied the *Biocycle* data for the years 2002 and 2004, which in turn affected the interpolated values for 2001, 2003, and 2005. As a result, the 2001-2005 values in Table A-136 attributed to *Biocycle* data are actually inflated by as much as 31%. Consider, for example, the year 2004. Table 4 of the *Biocycle* paper (Simmons et al, 2006) directly reports the total nationwide amount of MSW combusted as 28,860,545 short tons, equivalent to 26,182,285 metric tons. Yet Table A-136 of the draft report states that 34,181,035 metric tons were combusted in 2004, a value 31% higher than the stated *Biocycle* quantity ($34,181,035 / 26,182,285 = 1.31$).

We think we understand the source of the discrepancy. Starting with the year 2002 (which also affects the interpolated 2001 value) *Biocycle* began reporting the "MSW Generated" figures using a different methodology. See Themelis and Kaufman (2004) for a complete explanation. EPA apparently did not take this methodology change into account when calculating the MSW combusted quantities. Specifically, EPA incorrectly calculated the amount of MSW combusted by using Table 1 "Reported MSW Generation" and "MSW Waste-to-Energy" columns as follows:

$$\begin{aligned} & 509,155,516 \text{ short tons} \times 7.4\% \\ & = 37,677,508 \text{ short tons, or } 34,181,035 \text{ metric tons} \end{aligned}$$

To be correct, EPA should have calculated the combusted amount using the "MSW Generated" and "MSW Waste-to-Energy" columns in Table 1, which yields 26,037,823 metric tons, nearly the same as the *Biocycle* value reported in Table 4. (The small difference is due to rounding error; the actual combustion percentage is $28,860,545 / 387,855,461 = 7.44\%$ versus 7.4% shown in Table 1.)

Other independent sources on information confirm the appropriateness of the lower value of MSW disposed of at waste-to-energy facilities. The 2004 IWSA Directory of Waste-to-Energy Plants (Kiser and Zannes, 2004) reports annual MSW capacity as 28.7 million short tons, equivalent to 26.0 million metric tons.

The Department of Energy, Energy Information Administration (DOE/EIA) 906/920 reports also report WTE facility throughputs (DOE/EIA 2007). Reported 2004 throughput for the “MSW” fuel type was 26,643,163 metric tons, again consistent with the lower, correct values based on *Biocycle* data.

The DOE/EIA 906/920 report is credible. Comparing the list of facilities reporting in the DOE/EIA report with those in the IWSA directory shows that roughly 98% of the WTE capacity is accounted for in the DOE/EIA report.

Comment Table 1 compares EPA’s draft report MSW combustion quantities with the correct *Biocycle* quantities and DOE/EIA report quantities for the years 2001-2005. EPA should correct Table A-136, Table 3-45, and associated text to be consistent with the correct *Biocycle* data given in this table.

Comment Table 1. MSW Combustion in U.S. (metric tons)			
Correct Values from			
Incorrect Draft Values Based DOE/EIA			
Report Values on Biocycle 906/920			
Year From Table A-136 Data Reports			
2001	29,732,255	25,888,947	26,244,229
2002	33,723,677	25,802,917	27,700,143
2003	33,970,308	25,920,370	26,922,210
2004	34,181,035	26,037,823	26,643,163
2005	34,181,035	26,037,823	26,719,089

IWSA proposes that EPA remove the first column in Table A-136 called “EPA”. Data in this column are based on the *Characterization of Municipal Solid Waste in the United States* series of reports, also known as the Franklin reports (e.g., USEPA 2006). As discussed below, we question the use of these reports in general. In the case of MSW combustion quantities, Franklin claims to use industry data, but examination of its methodology shows they incorrectly cite capacity data from IWSA’s directory, effectively double-counting waste sent to refuse derived fuel facilities, and include combustion of tire-derived fuel and other separated wastes in the total reported quantities (USEPA 2006, pp. 137-138). If desired, EPA should use the DOE/EIA 906/920 Report database for comparative purposes in Table A-136.

Comment 2. EPA should avoid using data from the *Characterization of Municipal Solid Waste in the United States* report series (e.g., USEPA 2006), deferring to these reports only when no sources of direct information are available. (Section 3.9; Annex 3.6)

These reports, prepared by Franklin Associates, use the “materials flow methodology” in which nationwide MSW quantity and composition are not directly measured, but rather calculated using production data and material balances. This method has been shown to significantly underestimate the total quantity of MSW generated and landfilled when compared with methods that rely on direct measurement and reporting (Themelis and Kaufman 2004). EPA itself is avoiding use of the Franklin MSW quantities in Section 8 (Landfills) of the draft report, opting instead to use the *Biocycle* data (Simmons et al. 2006) which is based on direct input from State regulatory agencies. The following comment table shows the degree of the error associated with the Franklin reports:

Comment Table 2. Comparison of Franklin and Biocycle Data					
Franklin Biocycle Difference					
(million (million (million					Difference
Year MSW Data tons) tons) tons)					(%)
2002	Total Generated	235.5	369.4	133.9	56.9%
	Total Discards	165.0	270.8	105.8	64.1%
	Total Landfilled	131.7	242.3	110.6	84.0%
2004	Total Generated	247.3	387.9	140.6	56.9%
	Total Discards	169.6	277.3	107.7	63.5%
	Total Landfilled	135.5	248.6	113.1	83.5%

Given the significant under-estimates of total MSW quantities, any MSW compositional information derived from Franklin reports must also be considered suspect, and used with discretion.

IWSA wants to emphasize the basis for preferring the *Biocycle* data:

1. The annual numbers are similar to those generated by industry when preparing regulatory reports;
2. Data are comparable to those reported by DOE/EIA; and,
3. Data from a regulatory agency that is responsible for MSW management is a direct and accountable source of data versus the indirect manufacturing data used in the Franklin reports.

Waste-to-energy facilities are throughput limited (unlike landfills) and weigh MSW deliveries as a regulatory reporting requirement. Given the finite number of facilities (88), it is not very difficult to track total waste-to-energy industry performance with reasonable accuracy.

EPA assigns confidence ratings (A through E) to emission factors given in AP-42 (USEPA 1998). IWSA proposes that a similar methodology is appropriate here. When data are based on direct measurements (such as WTE facility MSW annual throughput), then they should be assigned a high confidence rating. Data based on other methods, such as the Franklin reports, should be assigned a lower grade. The error in the Franklin data is in the 40 to 80 % range. This type of error would seem to warrant a low confidence rating.

Comment 3. EPA's draft report significantly over-estimates the quantity of plastics combusted and the resulting amount of CO₂ emitted. (Section 3.9, page 3-51, Tables 3-43 and 3-44; Annex 3.6, page A-145, Tables A-129 and A-130)

Annex 3.6, Table A-129 presents the quantities of various plastics generated, recovered, and discarded based on Franklin report information. EPA's method for estimating CO₂ emissions from the combustion of plastics is of the form:

$$\text{CO}_2 = X * Y * Z$$

Where:

X = total amount of plastic in MSW discards

Y = fraction disposed of by combustion

Z = plastics carbon content

The Franklin data regarding the amount of plastics contained in MSW discards (“X”) and the specific carbon content of those plastics (“Z”) may or may not be valid; to our knowledge no comprehensive direct measurement data exist. However, the proportion of discards sent to landfill (80%) and combustion (Y= 20%) are clearly incorrect. The proportion of discards landfilled and combusted should be based on *Biocycle* data, which EPA has embraced in other sections of this draft report. EPA should not use the flawed Franklin data which has been shown to seriously under-estimate total discards and landfilled quantities, and has never been shown to be an accurate indicator of field data. Comment Table 3 shows the proportion of MSW discards combusted and landfilled based on the *Biocycle* data (Simmons et al. 2006, Table 1). EPA should use these data to calculate the quantities of plastics combusted for the years 1990-2005.

Comment Table 3. Proportion of MSW Discards Combusted and Landfilled.			
Year Combusted Landfilled Notes			
1990	13.0%	87.0%	
1991	11.6%	88.4%	
1992	13.3%	86.7%	
1993	12.3%	87.7%	
1994	13.0%	87.0%	
1995	13.7%	86.3%	
1996	13.9%	86.1%	
1997	12.9%	87.1%	
1998	10.9%	89.1%	
1999	10.4%	89.6%	
2000	10.3%	89.7%	
2001	10.4%	89.6%	Interpolated
2002	10.5%	89.5%	
2003	10.4%	89.6%	Interpolated
2004	10.3%	89.7%	
2005	10.3%	89.7%	Same as 2004

As a result of these corrected proportions, Tables A-129 and A-130 should be revised as shown below. (NOTE: Revised Table A-129 values are in Gg. Table A-129 values in the draft report are stated to be in Gg, but the values are actually in thousand short tons, as given in Table 7 of the Franklin report (USEPA 2006, page 50)).

Revised Table A-129: 2005 Plastics in the Municipal Solid Waste Stream by Resin (Gg)								
Waste Pathway	PET	HDPE	PVC	LDPE/LLDPE	PP	PS	Other	Total
Generation	2,595	5,343	1,488	5,851	3,629	2,350	4,971	26,227
Recovery	490	472	0	172	9	0	354	1,497
Discard	2,105	4,872	1,488	5,679	3,620	2,350	4,618	24,730
Landfill	1,887	4,367	1,334	5,091	3,245	2,106	4,140	22,171
Combustion	218	504	154	588	375	243	478	2,559
Recovery*	19%	9%	0%	3%	0%	0%	7%	6%

Discard*	81%	91%	100%	97%	100%	100%	93%	94%
Landfill*	73%	82%	90%	87%	89%	90%	83%	85%
Combustion*	8%	9%	10%	10%	10%	10%	10%	10%

*As a percent of waste generation

Revised Table A-130: 2005 Plastics Combusted (Gg), Carbon Content (%), Fraction Oxidized (%) and Carbon Combusted (Gg)								
Factor	PET	HDPE	PVC	LDPE/ LLDPE	PP	PS	Other	Total
Quantity Combusted	218	504	154	588	375	243	478	2,559
Carbon Content of Resin	63%	86%	38%	86%	86%	92%	66%	
Fraction Oxidized	98%	98%	98%	98%	98%	98%	98%	
Carbon in Resin Combusted	134	425	57	495	316	219	309	1,956
Emissions (Tg CO2 Eq.)	0.5	1.6	0.2	1.8	1.2	0.8	1.1	7.2

These revisions reduce the 2005 estimated CO2 emissions from plastics combustion from 13.9 Tg CO2Eq to 7.2 Tg CO2Eq. EPA should revise Tables 3-43 and 3-44 for all reporting years accordingly.

Comment 4. EPA's draft report significantly over-estimates the quantity of synthetic rubber combusted and the resulting amount of CO2. (Section 3.9, page 3-51, Tables 3-43 and 3-44; Annex 3.6, page A-147, Table A-133)

This comment is similar to the above comment regarding plastics. EPA used the same methodology to estimate the quantity of synthetic rubber in combusted MSW, and it too suffers the same inaccuracy as the plastics. Again, using the *Biocycle* data to determine the proportion of discards combusted (10.3%), the amount of synthetic rubber combusted in 2005 is 370 Gg, derived as follows:

Comment Table 4. Calculation of Rubber and Leather to Combustion in 2005				
	Total		Discards	
	Discards*	Total	Combusted	Combustion
Product Type	(000 tons)	(Gg)	(%)	(Gg)
Durables (not Tires)	2920	2,649	10.3%	274
Non-Durables				
Clothing and Footwear	700	635	10.3%	66
Other Non-Durables	290	263	10.3%	27
Containers and Packaging	30	27	10.3%	3
Total	3940	3,574	10.3%	370

*Total Discards from USEPA (2006), Table 8.

Table A-133 should be revised as shown:

Revised Table A-133: Rubber and Leather in Municipal Solid Waste in 2005	
Synthetic Carbon Fraction	
Combustion Rubber Content Oxidized	Emissions

Product Type (Gg) (%) (%) (%)					(Tg CO2Eq.)
Durables (not Tires)	274	100%	85%	98%	0.8
Non-Durables					
Clothing and Footwear	66	25%	85%	98%	0.1
Other Non-Durables	27	75%	85%	98%	0.1
Containers and Packaging	3	100%	85%	98%	0.0
Total	370				1.0

These revisions reduce the 2005 estimated CO2 emissions from synthetic rubber combustion from 1.9 Tg CO2Eq to 1.0 Tg CO2Eq. EPA should revise Tables 3-43 and 3-44 for all reporting years accordingly.

Comment 5. EPA's draft report significantly over-estimates the quantity of synthetic fibers combusted and the resulting amount of CO2. (Section 3.9, page 3-51, Tables 3-43 and 3-44; Annex 3.6, page A-148, Tables A-134)

Again, this comment is similar to the above comment regarding plastics. EPA used the same methodology to estimate the quantity of synthetic fibers in combusted MSW, and it contains the same inaccuracy. This inaccuracy should be corrected by using the *Biocycle* data to determine the proportion of waste combusted. Table A-134 should be revised as follows:

Revised Table A-134: Textiles in MSW (Gg)					
				%	
Year	Generation	Recovery	Discards	Combusted*	Combustion
1990	2884	328	2556	13.0%	332
1991	3008	347	2661	11.6%	309
1992	3286	387	2899	13.3%	384
1993	3386	397	2989	12.3%	369
1994	3604	432	3172	13.0%	412
1995	3674	447	3227	13.7%	442
1996	3832	472	3360	13.9%	467
1997	4090	526	3564	12.9%	458
1998	4269	556	3713	10.9%	407
1999	4498	611	3887	10.4%	406
2000	4686	640	4046	10.3%	417
2001	4870	715	4155	10.4%	432
2002	5093	740	4353	10.5%	457
2003	5257	755	4502	10.4%	469
2004	5371	849	4522	10.3%	468
2005	5530	844	4686	10.3%	485

*From *Biocycle* (Simmons et al. 2006)

In addition, we believe EPA made a mistake calculating the CO2 emissions for synthetic fibers found in Tables 3-43 and 3-44. We used the equation on page A-147 and were unable to duplicate EPA's values. The correct CO2 calculation for 2005 is as follows: 485 Gg fibers combusted x 55% synthetic x 70% carbon x 44/12 x 0.001 = 0.7 Tg CO2Eq.

These revisions reduce the 2005 estimated CO₂ emissions from synthetic fiber combustion from 2.4 Tg CO₂Eq to 0.7 Tg CO₂Eq. EPA should revise Tables 3-43 and 3-44 for all reporting years accordingly.

Comment 6. EPA should clarify that MSW combustion facilities do not combust significant quantities of tires and that CO₂ from tire combustion is attributable to other industry sectors. (Section 3.9, page 3-50, lines 30-32; Annex 3.6, page A-145)

We agree with the statement on page 3-50 that tire disposal practices differ from other MSW. Tires are usually collected and managed as a separate waste stream, appearing in very small quantities in the MSW delivered to waste-to-energy facilities. For example, as the operator of 31 waste-to-energy facilities in the United States, Covanta Energy Corporation does not solicit tires as a discrete waste stream because of generally unfavorable economics, and does not process bulk loads of tires because the operating problems they can create.

Section 3.9 gives the reader the impression that CO₂ emissions from tire combustion occur at waste-to-energy facilities. In fact, of the tires disposed via combustion, the vast majority is combusted as tire derived fuel (TDF) in other types of plants such as cement kilns, pulp and paper plants, industrial/utility boilers, and dedicated tire-to-energy plants. (RMA 2006)

EPA should clarify in the text and in Tables 3-43, 3-44 that CO₂ from tire combustion is attributable to other types of industries.

Comment 7. EPA should correct Tables 3-43 and 3-44 to be consistent with the above comments. (Section 3.9, page 3-51, Tables 3-43 and 3-44)

The following table shows the net effect of the above comments on the emissions of CO₂ from MSW combustion:

Comment Table 5. 2005 CO ₂ Emissions from MSW Combustion (Tg CO ₂ Eq.)			
Gas/Waste Product	Draft Report 2005	Corrected 2005	Notes
CO ₂	21.0	11.7	
Plastics	13.9	7.2	Comment 3
Synthetic Rubber in Tires*	1.2	1.2	Comment 6
Carbon Black in Tires*	1.6	1.6	Comment 6
Synthetic Rubber in MSW	1.9	1.0	Comment 4
Synthetic Fibers	2.4	0.7	Comment 5

*Emissions attributed to non-waste industries

Accordingly, EPA should re-calculate and revise Tables 3-43 and 3-44 for all reported years.

The Reasonableness of Our Comments and Revised Emissions Estimates

Whenever complicated analyses are used to derive information, it is prudent to have an independent, simplified approach to use as a “validation check”. In the case of MSW combustion

at WTE facilities, such an approach is readily available. The total (biogenic and non-biogenic) amount of CO₂ emitted from MSW combustion at waste-to-energy facilities is the product of MSW combustion throughput and the MSW CO₂ factor, both known with good accuracy. For 2005, MSW throughput was 26,037,823 metric tons (Simmons et al. 2006). The MSW CO₂ factor is calculated from EPA's MSW Fc factor of 1820 scf CO₂/MMBTU (40 CFR 60, Appendix A, Method 19, Table 19-2); for MSW with an average higher heating value of 5000 BTU/lb the CO₂ factor is:

$$\begin{aligned} &1820 \text{ scf/MMBTU} / 385 \text{ scf/mole} \times 44 \text{ lb/mole} \times (5000 \text{ E-6} \times 2000) \text{ MMBTU/ton} \\ &= 2080 \text{ lb CO}_2/\text{short ton MSW, or } 0.94 \text{ E-6 Tg CO}_2/\text{metric ton MSW} \end{aligned}$$

Total CO₂ emissions are calculated as follows:

$$\begin{aligned} &26,037,823 \text{ metric tons} \times 0.94 \text{ E-6 Tg CO}_2 \text{ Eq./metric ton} \\ &= 24.6 \text{ million metric tons, or } 24.6 \text{ Tg CO}_2 \text{ Eq.} \end{aligned}$$

Biogenic materials such as paper and cardboard, wood, food scraps and yard waste constitute the majority of carbon in MSW discards. Non-biogenic wastes such as plastics, synthetic rubber and textiles make up the remainder. This non-biogenic fraction is not known with certainty, but likely lies within a range of 20-40% of the total MSW carbon. Using this range, the non-biogenic CO₂ emitted from MSW combustion is between 4.9 and 9.8 Tg CO₂ Eq. This value can be compared to the total CO₂ from plastics, synthetic rubber and synthetic fibers in Comment Table 5. (Tires are not burned in waste-to-energy facilities.) See Comment Table 6. This “validation check” confirms that EPA's CO₂ estimate is overstated and that our revised emissions estimates are reasonable.

Comment Table 6. 2005 WTE CO ₂ Emissions (Tg CO ₂ Eq.)			
Non-biogenic Carbon	Draft Report	IWSA Comments	"Validation Check" Range
Plastics	13.9	7.2	
Synthetic Rubber in MSW	1.9	1.0	
Synthetic Fibers	2.4	0.7	
Total	18.2	8.9	4.9 to 9.8

Our estimates are also supported by EPA's own report, *Solid Waste Management and Greenhouse Gases, A Life-Cycle Assessment of Emissions and Sinks* (EPA 2006a). Exhibit 5-1 (page 70) of that report indicates that non-biogenic CO₂ emissions from “mixed MSW” combustion are 0.10 MTCE/short ton MSW, equivalent to 0.40 Tg CO₂ Eq./metric ton MSW. For 2005, the total non-biogenic CO₂ emissions would be

$$\begin{aligned} &26,037,823 \text{ metric tons} \times 0.40 \text{ E-6 Tg CO}_2 \text{ Eq./metric ton} \\ &= 10.5 \text{ Tg CO}_2 \text{ Eq.} \end{aligned}$$

Comparing this total value with Comment Table 5, our estimate of 11.7 Tg CO₂ Eq. is again validated.

Comment 8. Based on recent test data, EPA should revise estimates to show MSW combustion is an insignificant source of N2O emissions. (Section 3.9, page 3-51, Tables 3-43 and 3-44; Annex 3-6, page A-148)

The EPA continues to identify N2O as a characteristic emission of MSW combustion based on test data from older, foreign sources. We are submitting a stack test report (Avogadro 2007) containing very recent N2O emission data from a California waste-to-energy facility, a typical U.S. plant equipped with MACT-compliant spray dryer, fabric filter, carbon injection, and selective non-catalytic reduction air pollution control systems. The data show that no N2O was found at a method detection limit of 1 ppmdv and an average stack oxygen concentration of 11.4% dry, or 1.46 ppmdv @ 7% O2. For MSW with a higher heating value of 5000 BTU/lb this detection limit is equivalent to an N2O emission factor of

$$1.46 \text{ E-6} \times 14,389 \text{ scf/MMBTU} \times 44 \text{ lb/mole} / 385 \text{ scf/mole} \times 10 \text{ MMBTU/short ton MSW} \\ = 0.024 \text{ lb/short ton MSW, or } 12 \text{ g/metric ton MSW}$$

This emission factor is much smaller than 44 g/metric ton used in EPA's calculations. Using this emission factor, the revised 2005 annual N2O emissions from MSW combustion are less than

$$12 \text{ g/metric ton} \times 26,027,823 \text{ metric tons} \times 310 \text{ GWP} \\ = 0.097 \text{ Tg CO}_2 \text{ Eq.}$$

These revisions reduce the 2005 estimated N2O emissions from 0.5 Tg CO2Eq to <0.1Tg CO2Eq. Unless convincingly contradicted by EPA's own data representative of MACT-compliant U.S. waste-to-energy facilities, EPA should accept the Avogadro data and revise Tables 3-43 and 3-44 for all reporting years accordingly.

9. EPA should review and revise its uncertainty analysis for landfills. The convoluted methodology and absence of confirming direct measurement data suggest that the errors associated with LFG methane estimates are greater than the uncertainty range of -39% to +32% provided in Table 8-5. (Section 8.1, pages 8-4 and 8-5)

The methodology for calculating the amount of landfill methane emissions is represented by the simplified expression:

$$\text{CH}_4 \text{ Emitted} = \text{CH}_4 \text{ generated} - \text{CH}_4 \text{ recovered}$$

Technical literature on these variables is filled with statements of uncertainty for a variety of reasons, yet the draft report does not address these uncertainties in any detail, stating only that there is an error range of -39% to + 32 %. Comment Table 7 provides an overview of error-based issues that warrant EPA's review before finalizing the uncertainty analysis.

Calculation	Uncertainty Problem
-------------	---------------------

Total Methane Generated	Estimate based on a theoretical model that is never verified by actual field measurements. Long-term emissions including all operating phases of a landfill must be considered.
Recovered Methane	
Vendor Data	Measurements of pipeline values that are subject to compliance monitoring would be verifiable, but flare vendor data alone have little value without knowing annual capacity utilization factors for each.
EIA 1605 Database	Self-serving voluntary reports have potential for abuse and inaccuracy, and for double-counting in conjunction with LMOP database
LMOP Database	A review of EPA's LMOP case studies shows that only three sites actually have LFG collection measurements for comparison with theoretical predictions and these results varied between 20 and 50% recovery of LFG. What is the basis for an approximate nationwide average of ~ 47%?

Total methane generation quantities are highly uncertain, relying on a model to predict generation rate. The model is in turn dependent on values of two key factors derived from laboratory experiments – the methane generation potential (Lo), and the methane generation constant (k). In AP-42 (USEPA 1998) EPA acknowledges that “predicted methane emissions ranged from 38 to 492% of the actual, and had a relative standard deviation of 0.85” (USEPA 1998, page 2.4-4). And this is but one of the variables associated with the estimation of landfill methane emissions.

Another problem associated with the methodology is the reliance on EIA 1605 voluntary greenhouse gas reporting as a source of methane control information. Aside from potential reporting errors, there is potential for double-counting of emission reductions, as acknowledged by EIA itself (DOE/EIA 2004). In addition, reliance on two data sources (the LMOP database and EIA 1605 reports) to identify LFG-to-energy reduction projects compounds the double-counting concern, attempts to identify duplicate reporting notwithstanding. A single landfill may be known by several names including the name of the landfill, the name of the landfill operator, the name of the LFG-to-energy project, the owner or operator of the LFG-to-energy project, etc., allowing reviewers to believe more projects exist than actually do.

EPA's estimating method for landfill methane emissions relies on determining the difference between generated and collected methane because accurate direct measurement methods are not available. EPA should promote the development and use of monitoring methods for landfill

surfaces, leachate collection systems, and other methane emission points at landfills so that direct measurement can be used as the basis of future emission estimates.

10. EPA should reconsider its landfill methane emission re-calculation. (Section 8.1, page 8-5)

EPA provides no technical basis for the recalculation of landfill methane based on a six month delay time aside from EPA's statement that "a more accurate integrated model was applied". Where is the field evaluation of this statement? How does EPA simply recalculate a 4 % reduction when the unsubstantiated error band is -39 to +32 %?

11. EPA should review and if necessary lower its flare and LFG-to-energy methane destruction removal efficiency of 99%. (Section 8.1, page 8-4)

This 99% value used in the draft report may well be appropriate for well-maintained and operated flares; however, this level of performance cannot be assumed as typical or average for flares and other types of LFG combustion unless there is some form of compliance monitoring and enforcement of this parameter. If a flare or internal combustion engine does not have an enforceable permit condition that creates some form of limit, how can the EPA adopt a "best case" scenario? Comment Table 8 presents data from a number of LFGTE facilities that met permit compliance (a requirement in California), but did not achieve 99% destruction efficiency. EPA should review these and other data and revise its default methane destruction efficiency accordingly.

Comment Table 8. Methane Destruction Efficiency for Several LFG-to-Energy Projects							
LFG-to-Energy Facility Landfill A, Engine 1	Emission Test Date 3/23/2005	Inlet CH4 (lb/min) 14.3	CO2 (% dry) 10.8%	Outlet CH4 (ppmv) 2055	Flue Gas Flow (dscfm) 6367	Outlet CH4 (lb/min) 0.54	CH4 Destruction Efficiency (%) 96.2%
Landfill A, Engine 2	3/23/2005	14.4	11.1%	2965	6631	0.82	94.3%
Landfill A, Engine 3	3/23/2005	14.7	11.2%	1991	6254	0.52	96.5%
Landfill B, Engine 1	6/9/2005	11.4	8.2%	841	6080	0.21	98.1%
Landfill C, Engine 1	12/29/2004	5.5	10.4%	2425	2346	0.24	95.7%
Landfill D, Engine 1	4/8/2005	16.7	11.5%	2358	6404	0.63	96.3%
Landfill D, Engine 2	4/8/2005	16.3	11.0%	2358	6506	0.64	96.1%
Landfill E	1/25/2005	10.6	10.6%	3790	4366	0.69	93.5%
Landfill E	4/27/2004	10.7	10.7%	2931	4382	0.53	95.0%
Landfill E	12/20/1994	12.9	13.0%	1870	4350	0.34	97.4%

References for Comments 1 to 11

Simmons, et al. (2006) "15th Nationwide Survey of Municipal Solid Waste in the United States: The State of Garbage in America", *Biocycle*, April 2006.

Themelis, Nickolas J. and Scott Kaufman (2004) “State of Garbage in America – Data and Methodology Assessment” *Biocycle*, April 2004.

Kiser, Jonathan V.L. and Maria Zannes (2004), “The 2004 IWSA Directory of Waste-to- Energy Plants”, Integrated Waste Services Association.

Department of Energy/Energy Information Administration (DOE/EIA 2007), Form EIA- 906 and EIA-920 databases, years 2001-2005. Accessed at http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html (Note: The Excel file for each reporting year can be sorted to group facilities by fuel type code such as “MSW” or “TDF” and then summed to yield the nationwide total fuel quantities.)

USEPA (2006), “Municipal Solid Waste in the United States, 2005 Facts and Figures”, Office of Solid Waste, EPA 530-R06-011, October 2006. Accessed at <http://www.epa.gov/msw/pubs/mswchar05.pdf>

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USEPA (2006a), *Solid Waste Management and Greenhouse Gases, A Life-Cycle Assessment of Emissions and Sinks*, 3rd Edition, September, 2006. Accessed at <http://epa.gov/climatechange/wycd/waste/SWMGHGreport.html>

Avogadro Group (2007), “Source Test Report, 2007 Nitrous Oxide Emission Test, Solid Waste Fuel Boiler, Unit 1, Covanta Stanislaus, Inc., Crows Landing, California”, March 19, 2007.

Department of Energy/Energy Information Administration (DOE/EIA 2004), “Voluntary Reporting of Greenhouse Gases 2004”. Accessed at <http://www.eia.doe.gov/oiaf/1605/vr04data/drer.html>

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Attachment 2

Simmons, et al. (2006) “15th Nationwide Survey of Municipal Solid Waste in the United States: The State of Garbage in America”, *Biocycle*, April 2006.

Attachment 3

Avogadro Group (2007), “Source Test Report, 2007 Nitrous Oxide Emission Test, Solid Waste Fuel Boiler, Unit 1, Covanta Stanislaus, Inc., Crows Landing, California”, March 19, 2007.

Comment 14

Karen Ritter—American Petroleum Institute

March 30, 2007

Review of EPA's Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005

The American Petroleum Institute (API) appreciates the opportunity to offer input to the US EPA on the draft 2005 US inventory of greenhouse gas emissions (referred to as the EPA inventory report). CO₂

In preparing these comments, API is relying on its extensive experience in greenhouse gas emissions estimation and reporting. This experience includes:

- Production of the *Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions* (IPIECA/OGP/API, December 2003);
- Development of the *API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Gas Industry* ('Road Test' version April 2001; Revised February 2004); and
- Participation in the Expert 'Cadre' of the US Technical Advisory Group (TAG) to the International Standards Organization (ISO).

Comments and Recommendations

- (Section 3.1. Carbon Dioxide Emissions from Fossil Fuel Combustion, p. 121) The Recalculations Discussion indicates that EPA has revised the combustion methodology to apply a fuel oxidation factor of 100% for all fuel types. We support this revision, which is consistent with the recently revised 2006 IPCC Inventory Guidelines and is the preferred approach in the API Compendium.
- (Annex 3.4 Natural Gas Systems) Table A-119 reports GRI/EPA ('96) Activity Factors and Emission Factor values for the distribution stage, as stated in the text. Emissions listed in Table A-119 do not correspond with the emissions in Table A-121. The emissions in the Table A-119 appear to be in MEGAGRAMS and not GIGAGRAMS as noted in the title of the table.
- (Annex 3.4 Natural Gas Systems) The Annex is the portion of the report for all the detail behind the emission calculations. In this annex, the details behind the CH₄ emission calculations are displayed for the distribution stage as an illustration for all sectors. This full disclosure is helpful, but EPA should disclose this same amount of background information for all stages including: production, processing, and transportation/storage stages.
- (Annex 3.4 Natural Gas Systems) Only the production sector has background CO₂ emission data in Table A-124. More detail on the calculation of the CO₂ emissions would be appropriate in the annex for all natural gas industry sectors.
- (Annex 3.4 Natural Gas Systems Tables A-123 and A-124) Additional text in the Annex is recommended to explain the data being displayed in these tables and how this data was used in the calculation of CH₄ and CO₂ emissions.

- (Annex 3.5 Petroleum Systems) Would be helpful to provide Bcf/yr emissions data for all years in Table A-128 in place of a repeat of Table 3-34 data.
- (3.7 Petroleum Systems and Annex 3.5 Petroleum Systems) Production categories in report body tables do not match divisions of the sector as described in the report body or in the Annex. Recommend using same divisions as in Annex tables.
- (3.8 Natural Gas Systems) Base year (1992) not included in emission tables.

Sincerely,

Karin Ritter
Manager

Comment 15

Cynthia A. Finley—National Association of Clean Water Agencies

March 29, 2007

**Re: NACWA Comments on Wastewater Treatment Emissions Estimates in EPA's
*Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005, Draft for Public Review***

Dear Mr. Hockstad:

The National Association of Clean Water Agencies (NACWA) has reviewed Section 8.2, *Wastewater Treatment*, of the U.S. Environmental Protection Agency's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005, Draft for Public Review (Draft Inventory)*. NACWA represents the interests of nearly 300 publicly owned wastewater treatment agencies nationwide. NACWA's members serve the majority of the sewered population in the U.S., and collectively treat and reclaim more than 18 billion gallons of wastewater each day. NACWA members are very much aware of the growing importance of global climate change and are already engaged in efforts to reduce greenhouse gas emissions. As more state-wide and national efforts are launched to curb levels of greenhouse gases, EPA's *Inventory* will certainly take on added significance.

Our review of the *Draft Inventory* indicates that greenhouse gas emissions from wastewater treatment may have been over-estimated, and our attached comments outline the factors that appear too conservative and lead to the over-estimation. These comments are a revision of NACWA's previously submitted comments on the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005, Draft for Expert Review*. We appreciate EPA's response to our previous comments, including further explanations of how emissions estimates were calculated in the *Inventory* and how EPA must use the Intergovernmental Panel on Climate Change (IPCC) protocol for the estimates in the absence of other data. NACWA appreciates the clarifications made to the text of the *Draft Inventory* based on our previous comments, and we thank EPA for its willingness to work with NACWA members to refine the greenhouse gas emissions estimates for wastewater treatment using a data-based approach, as opposed to theoretical assumptions. We are already investigating what data we could collect to support our recommendations for changing the emissions estimates, and we look forward to sharing our results with you in the future.

Thank you for the opportunity to comment on the *Draft Inventory*. Please contact me at 202/296-9836 or cfinley@nacwa.org if you have any questions about our review.

Sincerely,

Cynthia A. Finley
Director, Regulatory Affairs

Attachment

Our review of the *Draft Inventory* indicates that greenhouse gas emissions from wastewater treatment may have been over-estimated, and our attached comments outline the factors that appear too conservative and lead to the over-estimation. These comments are a revision of NACWA's previously submitted comments on the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005, Draft for Expert Review*. We appreciate EPA's response to our previous comments, including further explanations of how emissions estimates were calculated in the *Inventory* and how EPA must use the Intergovernmental Panel on Climate Change (IPCC) protocol for the estimates in the absence of other data. NACWA appreciates the clarifications made to the text of the *Draft Inventory* based on our previous comments, and we thank EPA for its willingness to work with NACWA members to refine the greenhouse gas emissions estimates for wastewater treatment using a data-based approach, as opposed to theoretical assumptions. We are already investigating what data we could collect to support our recommendations for changing the emissions estimates, and we look forward to sharing our results with you in the future.

The National Association of Clean Water Agencies (NACWA) has reviewed the wastewater treatment greenhouse gas (GHG) emission estimates contained in the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005, Draft for Public Review (Draft Inventory)*. Overall, we are concerned that the methodology used for the emission estimates leads to an overestimation of the contribution of wastewater treatment to total GHG emissions from all sources. We recognize that uncertainty exists in calculations of this type and that EPA has attempted to calculate a "mid-range" value of the GHG emissions, and determine upper and lower bounds on the emissions estimate through an uncertainty analysis. However, we believe that some of the factors used in the calculations are conservative, which results in elevated values for the emissions estimates and the uncertainty bounds. NACWA's specific comments regarding these factors are provided below.

1. As we understand the methane (CH₄) emission methodology, the maximum CH₄ producing capacity for domestic wastewater, termed the Bo value, of 0.6 kg CH₄/kg BOD assumes that all organic matter in wastewater treated anaerobically is converted to CH₄, whether it is biodegradable or not. This Bo value is then multiplied by a methane correction factor (MCF) which quantifies how much of the influent organic matter is actually converted to CH₄. The MCF is 0.5 for septic systems and 0.8 for anaerobic systems. We believe that the maximum MCF should be 2/3 or 0.67, since several well-recognized and commonly accepted references (e.g. Metcalf & Eddy¹⁵ and Grady, Daigger, and Lim¹⁶) indicate that no more than about two-thirds of the organic matter in domestic wastewater is biodegradable. The MCF accounts for the portion of the organic matter that is stabilized anaerobically (versus aerobically) and also for the portion that is incorporated into sludge. The fact that all wastewater treatment facilities produce sludge reinforces the fact that an MCF of 0.8 is overly conservative. Thus, it appears that the maximum CH₄ producing potential was coupled with the maximum potential conversion

¹⁵ Tchobanoglous, G., F.L. Burton, and H.D. Stensel, *Wastewater Engineering: Treatment and Reuse*, Metcalf & Eddy, Inc. 4th Edition, McGraw-Hill, New York, 2003.

¹⁶ Grady, C. P. L., Jr., G. T. Daigger, and H. C. Lim, *Biological Wastewater Treatment*, 2nd Edition, Marcel Dekker, NY, 1999.

to CH₄, resulting not in a “mid-range” estimate but rather a “worst case” estimate. This methodology therefore appears to result in an overestimation of CH₄ emissions from domestic wastewater treatment.

2. The *Draft Inventory* separates central wastewater treatment systems into two categories: aerobic and anaerobic. No direct CH₄ emissions are assumed for the aerobic systems, but an MCF of 0.8 is assumed for the anaerobic systems. As explained in Comment 1 above, we suggest that the MCF should be no more than 0.67 if the system is fully anaerobic. However, exclusive anaerobic treatment of domestic wastewater is not practiced in the U.S. Instead, the general practice is to use facultative lagoons which incorporate a combination of aerobic and anaerobic processes or natural treatment systems such as wetlands that use largely aerobic treatment mechanisms (see Metcalf & Eddy). Given the fact that these systems incorporate both aerobic and anaerobic treatment mechanisms, we suggest that a MCF of less than 0.67 (our recommended maximum value for anaerobic systems from Comment 1) is appropriate for these systems. In the *Planned Improvements Discussion* section of the *Draft Inventory*, EPA indicates their intention to investigate this further and potentially “differentiate between anaerobic systems to allow for the use of different MCFs for different types of anaerobic treatment systems.” We support this planned improvement.
3. Our analysis indicates that the total nitrogen load to wastewater treatment plants is systematically overestimated in the *Draft Inventory*, resulting in an overestimation of N₂O emissions from wastewater treatment. The *Draft Inventory* estimates nitrogen discharges to wastewater based on reported annual protein consumption, which is the methodology used in the Intergovernmental Panel on Climate Change (IPCC) protocol document¹⁷ (*IPCC Guidelines*). Expressed as nitrogen (N), the estimate for domestic sources is developed as follows: 42.1 kg protein/person/year x 0.16 kg N/kg protein x 1.4 Factor for Non-Consumption = 9.43 kg N/person/year This is further increased by a factor of 1.25 to account for industrial discharges, resulting in a total value of 1.25 x 9.43 or 11.79 kg N/person/year This value differs significantly from per capita wastewater discharge rates presented in standard references such as Metcalf & Eddy. Metcalf & Eddy report per capita nitrogen discharge rates to wastewater of 0.015 kg N/person/day. Converting this to a yearly value gives: 0.015 kg N/person/day x 365 days/year = 5.48 kg N/person/year This is less than half the value used in the *Draft Inventory* calculation. The values presented in standard industry references such as Metcalf & Eddy are supported by a wealth of data and have been widely confirmed in U.S. practice. We recommend that the IPCC protocol be replaced by a nitrogen discharge rate based on data collected from wastewater treatment plants in the U.S. This type of data, which was used in Metcalf & Eddy, includes all domestic sources of nitrogen, including meal production and consumption, the use of other nitrogen containing compounds, and both residential and commercial sources. The extent that this data includes incidental industrial discharges is unknown. In our judgment, the “base-line” or “mid-range” estimate of per capita nitrogen discharge should use a standard value near Metcalf & Eddy’s 5.48 kgN/person/year. The

¹⁷ IPCC, 2006 *IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National 18 Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T., and Tanabe K. (eds.) 19 Published: IGES, Japan, 2006.

uncertainty analysis should then consider the possibility of industrial discharges not incorporated into the standard per capita values, multiplying by the 1.25 factor currently used in the *Draft Inventory*. We recognize that EPA will need data to verify this recommended change, and NACWA is willing to work with EPA to obtain this data from wastewater treatment plants.

4. The *Draft Inventory* utilizes default IPCC emission factors to calculate N₂O emission rates from wastewater treatment. These emission factors are very uncertain, though, as explained in the *IPCC Guidelines* and noted in the *Planned Improvements Discussion* section of the *Draft Inventory*. For example, the default emission factor for nitrogen discharged in plant effluents is 0.005 kg N₂O-N/kg sewage-N produced, but the range of possible values extends over many orders of magnitude, from 0.0005 to 0.025 or 0.25. In the *IPCC Guidelines*, the upper bound is shown as 0.025 in Table 11.3 and as 0.25 in Section 6.3.1.2. The upper range used by EPA should be clarified. Also, the results of the uncertainty analysis in the *Draft Inventory* indicate a 95 percent confidence interval of only 38 percent below to 47 percent above the emission estimate, which does not seem to reflect the high degree of uncertainty in the emission factor. Based on this large uncertainty and the seemingly arbitrary choice of the 0.005 factor value in the *IPCC Guidelines*, NACWA believes that more work is needed to refine the emission factors and determine a more accurate N₂O emission estimate for wastewater treatment.

Comment 16

Rhea Hale—American Forest and Paper Association

March 29, 2007

RE: Comments on the Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005

The American Forest & Paper Association (AF&PA) appreciates the opportunity to comment on EPA's Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005. AF&PA is the national trade association of the forest, paper, and wood products industry. AF&PA represents more than 200 companies and related associations that engage in or represent the manufacture of pulp, paper, paperboard, and wood products.

In the draft inventory, the "Harvested Wood Carbon" discussion on page 10 of Chapter 7, Land Use, Land-Use Change and Forestry indicates that the methodology for calculating carbon sequestration in products has changed from the methodology used in previous years.

The new mathematical relationship for describing the time in use of harvested wood products, the first order decay curve, does not adequately describe the fate of certain paper products that may have short half-lives but where a significant fraction of the material remains in use for long times (e.g. paper used in gypsum board and newsprint insulation). The time-in-use curves should reflect this long-term storage. The curve previously used to develop the estimates, the Row and Phelps decay curve, was more appropriate for these materials.

Thank you for your consideration and please do not hesitate to contact me should you have any questions regarding these comments.

Sincerely,

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